T 168 Sampling Bituminous Paving Mixtures

1. Which of the following containers may be used for samples of open-graded Hot Mix Asphalt?

   a. Stainless steel bowls.

   b. Cardboard boxes.

   c. Wide-mouth plastic container with screw cap; protect sample from freezing.

   d. a & b

   e. All of the above.

2. Which of the following statements is **incorrect**?

   a. When using an attached sampling device to obtain samples of HMA, one must pass the container twice through the material perpendicularly without overfilling.

   b. Samples of dense-graded mixtures may be placed in cardboard boxes or other agency approved containers.

   c. When sampling from the roadway prior to compaction using the plate method, it is always required to use the plate and cookie cutter sampling device.

   d. a & b

   e. None of the above.

3. Which of the following statements is true?

   a. HMA sample size depends on the test methods specified by the agency for acceptance. The agency requirement therefore governs required sample size.

   b. Samples used for acceptance tests must be selected at random. Samples may be obtained by the purchaser or authorized representative.

   c. When using mechanical sampling devices that are manually operated, no special caution is required regarding consistent speed in passing the device through the material.

   d. a & b

   e. All of the above.

R 47 Reducing Samples of HMA to Testing Size

4. According to this FOP, use of Mechanical Splitter Type A (Quartermaster) or Mechanical Splitter Type B (Riffle Splitter) is preferred…

   a. when reducing samples to a size appropriate for individual test procedures.

   b. because it allows rapid sample reduction while the sample is still warm enough to separate readily.

   c. Never.

   d. a & b

   e. None of the above.

5. When reducing HMA samples to testing size by Mechanical Splitter Type A (Quartermaster)…

    a. HMA from diagonally opposite receptacles must be combined either to form the sample, or for further reduction to testing size.
    b. surfaces that will be in contact with HMA must be heated to a temperature not exceeding 230ºF prior to use.
    c. use of the agency-approved release agent is not permitted.
    d. a & b
    e. None of the above.

6. Which of the following **does** **not** describe the Quartering Template at time of use?

    a. The template is manufactured of metal that will withstand heat and use without deforming.
    b. The template is formed in the shape of a cross having equal length sides at right angles to each other. Length and height of sides must exceed the diameter and thickness of the flattened cone of HMA.
    c. The template may be heated prior to use and may receive a light coating of approved release agent.
    d. None of the above.

7. With the exception of miscellaneous tools such as trowels, spatulas, taping knives, etc., the apparatus for which method(s) are not allowed to be heated prior to use?

    a. Mechanical Splitter Type A (Quartermaster)
    b. Mechanical Splitter Type B (Riffle Splitter)
    c. Quartering Method
    d. a & b
    e. None of the above. All reduction apparatus may be heated.

T 329 Moisture Content of Hot Mix Asphalt (HMA) by Oven Method

8. When determining HMA moisture content by this FOP, the minimum sample mass is _____ . Sample masses are determined to _____ .

    a. 1000 grams - - 0.1 gram or 0.1% of sample mass whichever is greater.
    b. 500 grams - - 0.1% of sample mass.
    c. 1000 grams - - 0.1 gram.
    d. None of the above.

9. According to this FOP, what constitutes constant mass?

   a. After initially drying for 90 minutes, constant mass has been achieved when further drying does not alter the mass by more than 0.01% after an additional 30 minutes of drying.
   b. After initially drying for 45 minutes, constant mass has been achieved when further drying does not alter the mass by more than 0.01% after an additional 15 minutes of drying.
   c. After initially drying for 90 minutes, constant mass has been achieved when further drying does not alter the mass by more than 0.05% after an additional 30 minutes of drying.
   d. After initially drying for 45 minutes, constant mass has been achieved when further drying does not alter the mass by more than 0.05% after an additional 15 minutes of drying.
   e. None of the above. Because this moisture determination is used for binder content correction, there can be no mass loss after the additional drying period.

10. Moisture content calculation.

$$\text{Moisture Content} = \frac{M_i - M_f}{M_f} \times 100$$

   Known:

Mass of dry, clean container	= 503.4 grams
Sample + container (initial moist condition)	= 2768.4 grams
Sample + container (final dry condition)	= 2764.2 grams

   The reported moisture content is _____ percent.

   a. 0.19
   b. 0.18
   c. 0.2
   d. None of the above.

T 308 Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method

11. According to this FOP, binder content is calculated as the difference between the initial mass of the HMA and the mass of the residual aggregate. The binder content is expressed as a percent of initial HMA mass only when the agency expresses binder content as a percent of initial HMA mass.

   a. True
   b. False

12. According to this FOP, if the mixture is not sufficiently soft to separate with a spatula or trowel, place it in a large flat pan in an oven at _____ until soft enough.

    a. Mixing Temperature.
    b. Compaction Temperature.
    c. 325° F
    d. None of the above.

13. Asphalt binder content correction factor (C_f) calculation:

$$Cf = \left[\frac{M_i - M_f}{M_i} \right] \times 100 - \text{JMF Binder Content}$$

    Known:

	Sample 1	Sample 2
Mass of empty basket assembly	= 3070.6 grams	3079.1 grams
Sample + basket before ignition	= 5210.7 grams	5204.4 grams
Sample + basket after ignition	= 5081.5 grams	5079.0 grams
JMF Design Binder Content	= 4.90 percent	

    Based on the two determinations, the asphalt binder content correction factor would be _____ percent. Is this factor acceptable for use at a set point temperature of 1000°F?

    a. 1.07 - - No
    b. 1.44 - - Yes
    c. −1.44 - - No
    d. −1.07 - - Yes
    e. None of the above.

T 209 Theoretical Maximum Specific Gravity and Density of Hot Mix Asphalt

14. Which method always requires use of a temperature correction factor?

    a. Bowl Method
    b. Flask Method
    c. Both methods
    d. Neither method

15. According to this FOP, the mass of the bowl filled with water at 77±0.9°F is determined for use as "D" for the G_{mm} calculation.

    a. True
    b. False

16. Rice Calculation

$$G_{mm} = \left[\frac{A}{A + D - E} \right]$$

Known:

		Sample 1	Sample 2
Dry, Cooled Sample Mass (A)	=	2186.4 grams	2105.1 grams
Mass of Flask + Water (D)	=	7681.9 grams	7681.9 grams
Mass of Flask + Water + Sample (E)	=	8993.0 grams	8947.1 grams

Based on the information provided what is the average G_{mm}? Is the test valid (Yes/No)?

_____

If the test is not valid, why is this the case?

_____

_____

17. Describe the procedure used to check for uncoated porous aggregates.

_____

_____

_____

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T 166 Bulk Specific Gravity of Compacted Hot Mix Asphalt Using Saturated Surface-Dry Specimens

T275 Bulk Specific Gravity of Compacted Hot Mix Asphalt Using Paraffin-Coated Specimens

18. According to this FOP, for Methods "D" and "E" (Coated Specimens) when is dry mass determined; for methods "A" and "B" (SSD Specimens)?

    a. Dry mass is always determined first regardless of test method.
    b. Dry mass is determined last for methods "D" and "E." It is always determined first for methods "A" and "B."
    c. Dry mass should be determined last for all test methods because doing so expedites the process (shortens the time required for completion).
    d. Dry mass is determined first for methods "D" and "E." Dry mass may be determined either first or last for methods "A" and "B."
    e. None of the above. The sequence of mass determinations may be in any convenient order regardless of test method.

19. Under which conditions is Method B (Volumeter) **not permitted**.

    a. When the specimen has less than two (2) percent absorption by volume.
    b. When the specimen has more than two (2) percent absorption by mass.
    c. When the specimen has air voids exceeding six (6) percent.
    d. All of the above.
    e. None of the above.

20. Bulk Specific Gravity and Absorption Calculations (Suspension Method):

$$G_{mb} = \frac{A}{B-C} \qquad\qquad Absorption = \frac{B-A}{B-C} \times 100$$

Known
    Dry Specimen Mass (A)   = 4671.1 grams
    SSD Specimen Mass (B)   = 4710.0 grams
    Submerged Specimen Weight (C)   = 2703.5 grams

Based on the information provided, the G_{mb} is_____. The procedure represented is _____ (A, B, D or E). Is this a valid test method for the specimen data provided (Yes/No)?

T40 Sampling Bituminous Materials

21. According to this FOP, which kind(s) of material must be protected from freezing?

a. Only material sampled when in the solid or semi-solid state.

b. Performance Graded (PG) Binders sampled from the HMA plant, because freezing may cause changes that alter the binder grade.

c. Cutbacks and HMA binders.

d. Emulsions and cutbacks.

e. None of the above.

22. What special precaution(s) must be taken when sampling emulsified asphalt?

a. Emulsions must be sampled prior to dilution unless the material is obtained directly from the spray bar, in which case the binder is considered to be representative of that used on the roadway.

b. No special precautions are required other than those concerning cleanliness of the container.

c. Emulsions may only be sampled from the delivery truck to avoid contamination that occurs when pumping into the distributor.

d. The sample container must be completely filled to avoid formation of a skin on the sample.

e. None of the above.

T 30 Mechanical Analysis of Extracted Aggregate

Gradation Calculations:

Dry mass of sample, before washing: 1798.6 g
Dry mass of sample, after washing: 1660.1 g

Sieve Size (in.)	Mass Retained g	Ind. Percent Retained	Cumulative Mass Retained g	Cum. Percent Retained	Calc'd Percent Passing	Agg. Corr. Factor From T-308	Reported Percent Passing
3/4	0		0				
1/2	35.5		35.5			-1.9	
3/8	244.7		280.2			-2.3	
1/4	240.0		520.2			-1.1	
No. 4	273.5		793.7			-0.9	
No. 8	377.1		1170.8			0.7	
No. 30	209.9		1380.7			-3.3	
No. 50	124.2		1504.9			-1.8	
No. 100	88.7		1593.6			-1.1	
No. 200	34.4		1628.0			-0.7	
Pan	29.4		1657.4				

23. For the No. 100 sieve, the individual percent retained is _____. The calculated percent passing is _____. The final reported percent passing is _____. The sample is acceptable when evaluated for unexplained change in sample mass (True/False).

   _____

   Based on the data presented, would corrections be required for all sieves (Yes/No)? _____

   If corrections **are** required for all sieves, why is this the case? _____

   _____

   _____

   _____

24. When performing the annual evaluation of mechanical shakers for sieving efficiency, continue shaking for a sufficient period so that after completion, not more than 0.5% by mass **(based on individual mass retained on any given sieve)** passes during one minute of continuous hand sieving.

   a. True
   b. False

T 312 Preparing and Determining the Density of HMA Specimens by Means of the Superpave Gyratory Compactor

25. The angle of gyration may refer to either the internal or external angle.
    a. True
    b. False

26. The angle of gyration and pressure applied during compaction must be within a specified range. The correct angle is _____ ; the correct pressure applied during compaction is _____ .
    a. 1.25±0.02º - - 600±18 Pa.
    b. 1.16±0.02º - - 600±16 kPa.
    c. 1.25±0.02º - - 600±18 kPa.
    d. 1.16±0.02º - - 600±16 Pa.
    e. None of the above.

27. This FOP covers preparing gyratory-compacted specimens that may be used for field control of HMA production processes.
    a. True
    b. False

28. After filling the mold, leveling the HMA and installing the paper disc, what next must be done?

    _____

    _____

    _____